Remarks on *Distoma clavatum* from a Sword-fish. By T. Spencer Cobbold, M.D., F.R.S., F.L.S., Lecturer on Comparative Anatomy at the Middlesex Hospital.

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During my stay at Lynn, Norfolk, in August 1865, a fine example of the common Sword-fish (*Xiphias gladius*) was cast ashore in the estuary. Although quite dead when discovered, the creature was in a tolerably fresh condition; and when subsequently dissected by Dr. John Lowe and myself, some of its internal parasites were still alive. Respecting the structure of the fish I do not propose to offer any particulars; but it may be worth while remarking that it measured exactly ten feet and two inches from the tip of the snout to the end of the upper division of the tail. Several other careful measurements were taken, which, together with useful data regarding the natural history of the species, will, I believe, be placed on record by Dr. Lowe, who has for some years past devoted much attention to the zoology of the Norfolk estuary, and especially to the fishes.

Five different species of Entozoa were encountered in the flesh and intestinal canal of this Sword-fish—namely, *Distoma clavatum*, *Ascaris incurva*, *Bothriocephalus plicatus*, *Tetrarhynchus attenuatus*, and a form of Scolex referable to a second species of the last-named genus. On the first-named of these parasites I proceed to offer some observations—not, indeed, with the view of seeking to establish the existence of new species by splitting up an old one, but rather for the purpose of showing that the *Distoma clavatum* may be viewed as representing a variety of forms hitherto regarded as separate species by helminthological writers.

Distoma clavatum.—Five examples of a trematode, which I believe to be referable to this species, were found in the stomach. They severally varied in length from four lines to two inches. They were dead, and apparently only very slightly if at all decomposed. They differed somewhat in shape; but all had the so-called head and neck directed backwards. In one example the anterior slender moiety formed a right angle with the body proper, the margin of the ventral acetabulum, viewed from before, being, as it were, placed on a level with the oral sucker. Below the ventral sucker, the two largest specimens were distended with eggs and black pigmentary matter, all of them showing, internally, a dark spot near the centre of the neck. All

of them likewise exhibited more or less well-marked transverse rugæ, extending from the root of the ventral sucker to the lower end of the body. The last ring thus formed surrounded a distinct caudal orifice, representing the outlet of a largely developed contractile vesicle. The eggs presented an average longitudinal diameter of $\frac{1}{800}''$. Some other points bearing upon the question of specific difference will be incidentally mentioned below.

When recently occupied in revising the collection of Entozoa contained in the Museum of the Royal College of Surgeons, I encountered a considerable variety of parasites without any labels attached, or any mark capable of guiding one as to the source of the specimens. Amongst these were several flukes, which, though differing from each other in respect of size and shape, appeared to be identical species. One of these specimens I afterwards found to be the actual *Distoma clavatum* described and figured by Professor Owen in the Zoological Society's Transactions. Several of the others I have since (by comparing them with specimens deposited in the British Museum) clearly made out to be part of a series contributed by Mr. George Bennett; but the College Museum-stores contained yet a third group of specimens, whose history has hitherto evaded all my endeavours to unravel it. The large individual described by Professor Owen was formerly in the collection of the Rev. Lansdowne Guilding; but we do not know from what fish it was obtained. In Dr. Baird's catalogue, the specimens presented by Mr. Bennett are stated to have come from the stomach of the Bonito; and it is not improbable that Mr. Guilding's specimens, as well as many others whose history is wanting, may be referred to the same "host." Be that as it may, however, the specimens in question not only differ very markedly among themselves, but also, in some respects, from many other forms referable to the same species. I here allude to the various specimens described by systematists, some under one title and some under another. In fact, a species-splitter can point to five or six tolerably distinct forms, which in my view ought to be regarded as specifically identical. To prove this, however, it is necessary to investigate the matter with some care, and to pass in review all the more important notices which have from time to time appeared.

In the year 1730, M. Garsin, a surgeon in the employ of the Dutch East-Indian Company, and Corresponding Member of the French Academy of Sciences, first described this worm, under the generic title of *Hirudinella*. He says:—"Cet insecte tiré de

l'estomac de la Bonite ne vécut qu'environ deux heures. Exposé à l'air il étoit languissant, et reprenoit de la vivacité dans de l'eau de mer. Il diminua sensiblement de volume pendant qu'il vivoit encore"*. M. Garsin's brief description is accompanied by three figures, two of them giving a plan of the possible movements of the head and neck, on the one hand, and of the body on the other, the ventral sucker being the fixed point. His specimens do not appear to have exceeded one inch and a half in length.

In 1774, Pallas described a trematode under the generic and specific names of *Fasciola ventricosa*. It measured two inches in length; but we are left in doubt as to whether it was obtained from any fish. All that he says regarding its source is as follows: —"Ex Amboyna missum fuit singulare hoc molluscum, quod ad aliud quam Fasciolarum genus referre non potui, in quo quasi gigas erit"†. He remarks upon its pale white colour, and notices particularly the soft elastic body proper, which when wounded gave out a dark matter resembling soot. This material, when examined with the microscope, appeared perfectly fresh, and was not the result of decomposition. Pallas also gives many other details respecting the structure of the parasite, accompanied by a figure.

In 1790, Menzies likewise described and figured a fluke about two inches long, which, though differing remarkably from the foregoing in respect of shape, is nevertheless identical. His account of the parasite is recorded in the first volume of the Linnean Society's Transactions, and he calls it *Fasciola clavata*:—"It is of whitish colour, somewhat pellucid, discharging at its mouth a black-coloured fluid which can easily be perceived through its body. I have often found it," he adds, "in the maws of the Boneto, between the tropics in the Pacific Ocean"‡. Notwithstanding the similarity of description, Menzies does not appear to have recognized the identity of his worm with that described by Pallas. Professor Owen, however, subsequently established this identity, and referred to the species as *Fasciola clavata* seu *ventricosa*§. On the other hand, the British-Museum Catalogue represents Pallas's worm as specifically distinct from that of Menzies, but as identical with the specimen described by Professor Owen from Mr. Guilding's collection.

* Histoire de l'Acad. des Sciences à Paris, 1730, p. 44.
† Spicilegia Zoologica, Fascic. x. (1774) p. 18.
‡ Trans. Linn. Soc. vol. i. (1790) pp. 187, 188.
§ Trans. Zool. Soc. vol. i. (1835) p. 382.

In 1802, Bosc described and figured a trematode under the title of *Fasciola fusca*. This he obtained from the intestines of a Dorado. In form it differs considerably from any of the foregoing species, with all of which, however, it is probably identical. Bosc's description runs as follows:—"Brune, la partie postérieure très-renflée, presque ovale; la partie antérieure mince, cylindrique, inégale, avec deux petits tentacules en dessous. Le suçoir de l'anus très-grand"*. Bosc recognized the identity of his worm with the *Distoma Coryphenæ* of Rudolphi; and systematists generally have adopted his synonymy. In the British-Museum Catalogue the *Fasciola fusca* and *F. ventricosa* of Pallas are regarded as one and the same species. If two small appendages did really exist below the oral sucker, then Bosc's worm is certainly a distinct species. I have never seen anything resembling this amongst the trematode parasites—though the exserted penis might very well be mistaken for one such process. Helminthologists, generally, appear to have doubted the existence of such developments.

In 1827, Nardo obtained two very large flukes from the stomach of a fish captured in the Gulf of Venice during the month of September. He calls the fish *Prostostegus prototypus*, which appears to be the same as the *Luvarus imperialis* of Rafinesque. One of the parasites being no less than five inches in length and nearly half an inch in breadth, he appropriately named the species *Distoma gigas*, believing, naturally enough, that he had to deal with a new species. His description is as follows:—"Distoma teres, rubrum, retractile; poro ventrali minimo cujus apertura magna, rotunda, ciliata; poro antico terminali, parvo; collo brevi, retrorsum divergente, extensili, apice angusto, basi lato; cauda longa, postice incrassata et in apice obtuso osculo donata"†. Here, again, a character is introduced the nature of which it is extremely difficult to understand. I allude to the alleged ciliated condition of the ventral sucker, an appearance perhaps due to a wrinkled state of the lip. Apart from this I see no reason for supposing this parasite to be distinct from the *Distoma clavatum* procured by Mr. Guilding, or the *Fasciola ventricosa* described by Pallas. The intestines of the fish in question harboured another trematode parasite, to which Nardo applied the title *D. Rayneri-anum*. This appears to be a distinct species; but its size is not stated. Unfortunately, Nardo gives no figure of his *Distoma gigas*. It is by far the largest fluke at present known.

* Hist. Nat. des Vers, vol. i. (1802) p. 271.

† Isis, for 1833, p. 523; from Heisinger's 'Zeitschrift,' 1827, p. 68.

In the year 1835, Professor Owen communicated to the Zoological Society the anatomical memoir to which I have already made reference. In his paper he ably discusses several questions relating to the structure of *Distoma clavatum*, and throws considerable light upon the organization of this species. He quotes the previous writings of Pallas, Rudolphi, and Menzies, and establishes the identity of *Fasciola ventricosa* and *F. clavata*. Although some particulars are wanting respecting the precise mode of termination of the digestive tubes, I think that there can be no doubt as to the propriety of retaining this species amongst the true Distomes. I believe that the large "lateral cavities" described by Professor Owen are neither more nor less than the somewhat unusually distended alimentary cæca. In this particular every helminthologist is familiar with the varieties presented by different species of Trematoda. At all events, there is here no good ground for retaining the generic name *Fasciola*; and still less are we called upon to recognize any of the forms under the title of *Hirudinella*, although Garsin first described the species under this generic title.

In 1845, Dujardin placed the worm with the true Distomes, yet at the same time expressed grave doubts as to whether it were, in any sense, a fluke. "Ce ver," he remarks, "n'est certainement pas un distome ni même un trématode. Si sa forme extérieure et ses deux oscules lui donnent quelque ressemblance avec les distomes, sa structure musculeuse le rapproche davantage des Gordius, et son tégument ressemble à celui des siponcles." M. Dujardin carefully examined the specimens preserved in the Paris Museum; and with regard to one particular example, described as "Fasciola, trouvé dans la mer de Nice," he says, it presents "une certaine analogie avec le prétendu *Distoma clavatum*." Manifestly Dujardin himself was somewhat puzzled by the resemblances in question. He does not appear to have had any opportunity of examining fresh specimens; yet he mentions the species as tolerably common in the Bonito, being also occasionally present in the Tunny. At all events it would appear by evidence derived from various sources, that the rightly so-called *Distoma clavatum* is not unfrequently taken from the ocean quite independent of its piscine "bearers."

In reviewing the foregoing notices it is of course open to any naturalist to doubt if they can, one and all, be said to refer to the same species of parasite; yet, notwithstanding divergencies of statements, if any one will take the trouble to examine all the

specimens preserved in this country, I think he will arrive at the conviction which I have expressed at the outset of this paper. It is a comparatively easy task to name afresh every entozoon which happens to come into one's possession; but to ascertain how often it has previously been described may involve a good deal of labour. As an illustration of the truth of the latter remark, I subjoin a list of the synonyms which I believe to belong to the species under consideration:—*Distoma clavatum*, Rudolphi=*D. Coryphænæ*, Rud.=*D. gigas*, Nardo=*Fasciola clavata*, Menzies =*F. Coryphænæ*, Bosc=*F. Coryph. Hippuridis* and *F. Scombri Pelamidis*, Tilesius=*F. fusca*, Bosc=*Hirudinella marina*, Garsin =*H. clavata*, Baird.

Probably we may here also include Rudolphi's *Distoma tornatum*; but I have never seen the caudal extremity of *D. clavatum* projected to the extent described by Dujardin as occurring in *D. tornatum*, though I think it quite capable of becoming so. Diesing, in my view, gives this accidental invaginating process too much prominence as a specific character when he writes, in regard to *D. tornatum*, "Cauda longissima, gracilescente, moniliformi," overlooking the circumstance that the tail is normally truncated posteriorly. Whether the correctness of my opinions respecting the synonymy of *D. clavatum* be admitted or not, I am confident, as regards certain other reputedly distinct forms of this genus and its allies, that they have had a common origin. On this score I may adduce evidence on some future occasion.

Experiments with *Trichina spiralis*.

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The present record may be regarded as a sequel to my paper on 'Experiments with the Cestoid Entozoa' recently submitted to the Society. In conducting these investigations, I have received the friendly cooperation of Professor Simonds, and of Assistant Professor Pritchard, of the Royal Veterinary College.

Exps. 1 and 2. On the 15th March, 1865, an ounce of flesh containing Trichinæ was administered to a small black bitch. The dog was destroyed five days subsequently; but neither intestinal nor muscle-trichinæ were discovered. It was thought that the dog had thrown up the bolus, which was strongly saturated with